J. Raptor Res. 28(4):259-262

BREEDING DENSITY AND BROOD SIZE OF ROUGH-LEGGED HAWKS IN NORTHWESTERN QUÉBEC

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KEY WORDS: Buteo lagopus; *habitat; Hudson Bay; nest; reproduction; rough-legged hawk; survey.*

Rough-legged hawks (*Buteo lagopus*) breed in northern Canada and are especially common around Hudson Bay, Ungava Bay, the Labrador coast and the Arctic (Todd 1963, Palmer 1988). However, most nesting observations in eastern Canada are anecdotal and no information is available on breeding densities and reproduction of the species in the province of Québec. Proposed hydroelectric development in northwest Québec has increased interest in surveying raptor populations in that area. Field surveys are needed to accurately assess the potential impacts of these projects. We report the results of surveys of nesting rough-legged hawks in the Hudson Bay region of northwestern Québec. Our aim is to provide baseline data on the distribution, density, brood size, and nest-site characteristics of rough-legged hawks in the Hudson Bay region of Québec.

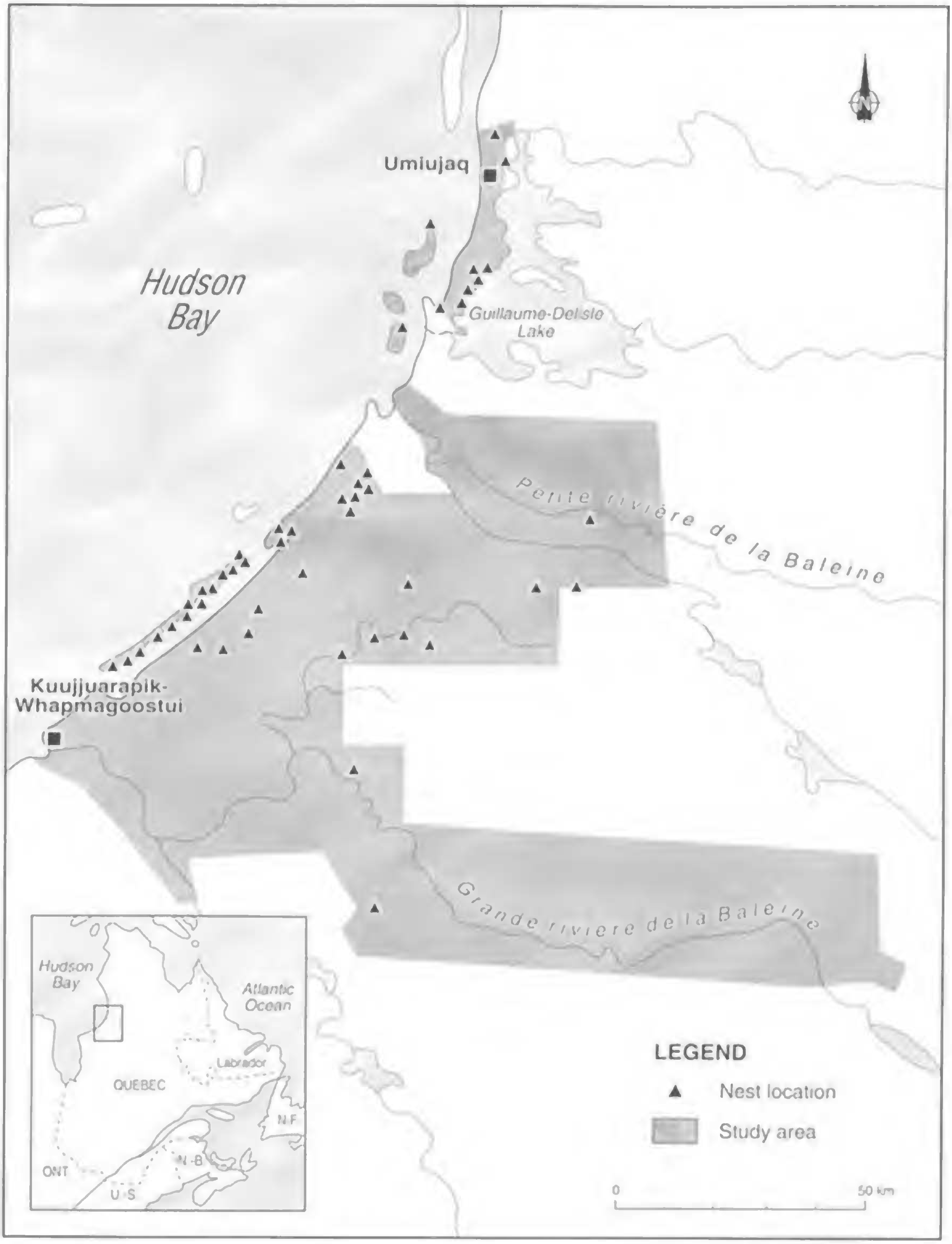
STUDY AREA AND METHODS

The surveys were conducted in parts of the basins of the rivers Grande Rivière de la Baleine and Petite Rivière de la Baleine, and Guillaume-Delisle Lake (55–57°N, 74–78°W), covering approximately 9850 km^2 (Fig. 1). The study area encompassed boreal forest, boreal forest-tundra ecotone, and a coastal strip of arctic tundra (Payette 1983). The dominant vegetation was black spruce (*Picea mariana*) with the density of trees decreasing from south to north. The rugged landscape has numerous inland rocky outcrops and coastal cliffs. A more thorough description of the study area is given in Morneau et al. (1994).

Prior to the surveys, cliffs were located on 1:50 000 scale maps of the study area by finding where contour lines were very close to one another. During the surveys all vertical rock faces, including those not identified on the maps, were visited. Steep rocky hills were not surveyed No attempts were made to locate nests in forests because tree nesting by rough-legged hawks, while occurring in other regions (Palmer 1988) has never been reported in the area. The cliffs were surveyed aboard an A Star 350 helicopter at a distance of 20 m at 30–70 km/hr. Several passes were made along high cliffs, the helicopter being flown successively lower at each pass (Kochert 1986, Fuller and Mosher 1987). Sixty hours were spent flying between 10–20 July 1990, with two to three observers plus the pilot. Flights were only conducted when weather conditions were favorable (i.e., no fog or precipitation). We plotted nest locations on a map and recorded number of eggs or nestlings present as well as nest orientation and height. In estimating mean brood size, only nests with chicks over 1 wk old and no eggs were considered. Nestlings were aged according to criteria established by Moritsch (1983). We also recorded the nests of other cliff-nesting raptors (golden eagle [*Aquila chrysaetos*], peregrine falcon [*Falco peregrinus*], red-tailed hawk [*Buteo jamaicensis*] and great horned owl [*Bubo virginianus*]).

RESULTS

Rough-legged hawks were the most abundant cliff-nesting bird of prey in the study area. During the surveys, 49 nests containing at least one nestling or nestlings and eggs ($N = 4$) were located. Fifteen golden eagle (see Morneau et al. 1994), one peregrine falcon, six red-tailed hawk, and two of great horned owl nests were found. The minimum density of rough-legged hawks was thus one breeding pair per 201 km^2. In addition, 70 empty *Buteo* nests were found, some of which may have been alternate nests and nests


Umiujaq
Hudson Bay
Guillaume-Delisle Lake
Petite rivière de la Baleine
Kuujjuarapik-Whapmagoostui
Grande rivière de la Baleine
Hudson Bay
Atlantic Ocean
Labrador
QUEBEC
N-F
N-B
ONT
U-S
LEGEND
Nest location
Study area
0
50 km

used in previous years or by pairs that failed early in the season (Palmer 1988). Some empty nests may have been built by red-tailed hawks, although cliff nests built by the latter were less abundant than rough-legged hawk nests and were in the boreal forest south of the Petite Rivière de la Baleine. The distribution of nests was not homogeneous within the study area, and most of them were located along the Hudson Bay coastline (see Fig. 1). The mean nearest-neighbor distance between rough-legged hawk nests was 4.95 km (SD = 3.82, N = 48 nests). The minimum distance between two active nests was 250 m, and another eight nests were less than 1 km apart. Minimum distances to active nests of other cliff-nesting raptors were 5.75 km for the peregrine falcon, 4.00 km for the golden eagle, 1.00 km for the great horned owl and 7.75 km for the red-tailed hawk. Rough-legged hawk nests were located at 6–90 m from the bottom of the cliff (mean = 19, SD = 15.4, N = 49 nests). Thirty-four (69.4%) nests faced south, southeast, or southwest. Of the rest, 13 (26.5%) faced north or northeast and two (4.1%) faced east. Five (10.2%) of the nests had overhangs. The mean brood size was 3.41 nestlings (SD = 1.09, range 1–6, N = 44 nests). The frequencies of brood sizes were as follows: one nestling (N = one nest), two (N = 9), three (N = 12), four (N = 16), five (N = 5), six (N = 1). During the surveys, most nestlings (36 of 48 broods) were covered in down and were estimated to be 1-2-wk-old. In addition, 11 nests contained young 3-wk-old and one nest contained young 4-wk-old.

DISCUSSION

Local populations of rough-legged hawks are known to fluctuate greatly in numbers from year to year (Mindell et al. 1987, Mindell and White 1988, Palmer 1988), and a single year survey did not allow us to assess whether the density (i.e., one breeding pair per 201 km^2) is typical for the area. Another rough-legged hawk population in the central Canadian Arctic varied from one breeding pair per 62.5 km^2 to one pair per 333.3 km^2 in a 4-yr study (Poole and Bromley 1988). Higher densities (1 pair/30–50 km^2) have been reported for forest dwelling rough-legged hawks in Finland (Pasanen 1972 *in* Palmer 1988). These comparisons, on the other hand, can be misleading, as the area that we surveyed was much larger than in the other studies. Moreover, the distribution of nesting pairs occurred in clusters in our study, and densities were much higher within those clusters.

Most rough-legged hawk nests were confined to the cliffs of the Hudson Bay coastline and adjacent islands, even though there were numerous cliffs in other parts of the study area. Irregular spacing of nests was also observed in the central Canadian Arctic by Poole and Bromley (1988), who suggested the distribution of rough-legged hawks was affected by the patchy distribution of microtine rodents. Nest-site characteristics that we observed were similar to those of previous studies (White and Cade 1971, Poole and Bromley 1988). Most nests in our study area lacked overhangs and most faced in a southerly direction. Orientation of the coastal relief and adjacent islands (SW–NE) provides abundant southeast- and east-facing rock faces in the western part of the study area but that pattern of relief is not present inland where cliffs face all directions. Nonetheless, other factors, such as the tempering effect of the Hudson Bay on temperature may also be involved in the irregular distribution of rough-legged hawks in our study area.

In our study, the minimum distance between nests of rough-legged hawks and other raptor species was larger than the minimum distance between nests of rough-legged hawks. This differs from Poole and Bromley (1988) and Schmutz et al. (1980) who found greater evidence for competition for space within than among species of raptors The mean brood size of 3.41 nestlings was higher than those found in other areas (2.8 [Sealy 1966] and 2.0–3 5 [Poole and Bromley 1988] in the Northwest Territories, Canada; 3.0 in Norway [Hagen 1952 *in* Palmer 1988], 2.0 in Finland [Pasanen 1972 *in* Palmer 1988]). According to Poole and Bromley (1988), the decline in brood size and in other reproductive parameters was correlated with the decrease in microtine numbers. Therefore, our data may have been collected in a good food year. Because the survey was conducted when the nestlings were relatively young, mortality of young may have occurred before fledging and we cannot estimate nest success or productivity.

RESUMEN.—Utilizando un helicoptero se prospecto un area de 9850 km^2 en el noroeste de Quebec para censar nidos de Ratonero Calzado (*Buteo lagopus*). Se observaron 49 nidos que contenian al menos un joven (1 nido ocupado por 201 km^2). Los Ratoneros Calzados eran las aves de presa mas abundantes en la zona. La mayoria de los nidos se concentraban en los acantilados de la Bahia de Hudson y en los de las islas adyacentes, a pesar de que tambien habia numerosas paredes rocosas en otras partes del area de estudio. El 69.4% de los nidos se orientaba hacia el sur y solo un 10% estaba protegido por extraplomos. El tamano medio de nidada, 3.41 pollos, fue similar al encontrado en otras poblaciones.

[Traducción Autores]

ACKNOWLEDGMENTS

This study was part of the Grande-Baleine hydroelectric project studies undertaken by Hydro-Québec, and part of the North American Peregrine Falcon five-year survey coordinated by M. Lepage (Min. de l'Environnement et de la Faune). We wish to thank R. McNicoll, P. Lafontaine, J. Carrier, R. Dulong and R. Julien for helping in the fieldwork. Gary Bortolotti, Josef Schmutz, and Ted Swem helped to improve the manuscript by their careful review.

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Figure 1. Study area and location of occupied nests of rough-legged hawks in 1990.

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Received 11 April 1994; accepted 18 July 1994

J Raptor Res. 28(4):262–265

EFFECTS OF PRESCRIBED FIRES ON HABITAT USE BY WINTERING RAPTORS ON A TEXAS BARRIER ISLAND GRASSLAND

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KEY WORDS: *American kestrel;* Circus cyaneus; Falco sparverius; *fire; habitat use; northern harrier; Texas.*

The structure of vegetation at ground level in grasslands appears to be of greater importance than prey abundance in selection of hunting sites by birds of prey (Janes 1985, Preston 1990). Land management practices that affect raptor habitat will, therefore, be those that affect vegetation structure rather than impact solely prey abundance (Millsap et al. 1987). Fire can affect raptors primarily by altering the quality of habitat parameters such as cover and prey availability. Burning and maintaining grasslands provides habitat for northern harriers (*Circus cyaneus*) and short-eared owls (*Asio flammeus*) (Hamerstrom 1974) during the breeding season. Considerably less is known about the effects of prescribed fires on winter habitat use by raptors.

In monitoring the effects of fire on animal communities researchers have generally considered periods of one or more years post-burn (Peterson and Best 1987, Pylypec 1991). Considerably less effort has been made to monitor the immediate effects of fire on wildlife communities. As suitable wintering habitats become limiting, understanding the immediate effects the management practices that